National Aeronautics and Space Administration

MARSHALL STAR

Serving the Marshall Space Flight Center Community

Aug. 5, 2010

Taking a shot at the sun

By Nick Brown

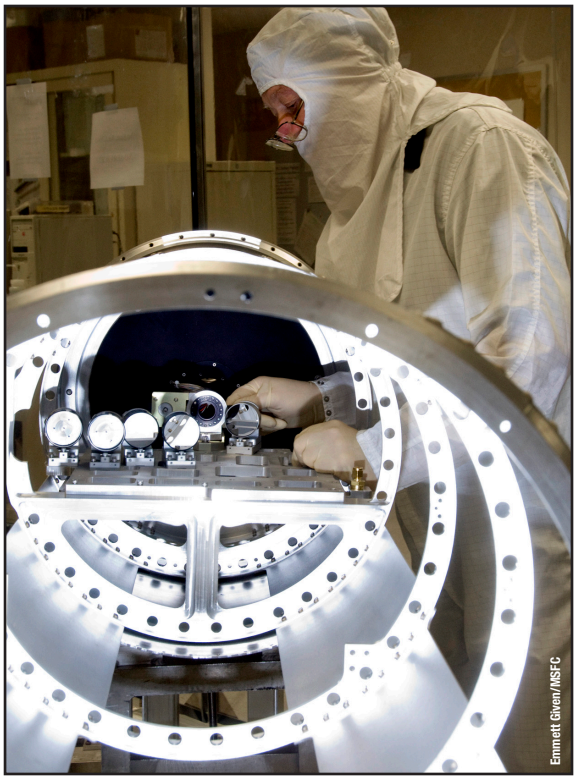
On July 30, for a thrilling eight minutes, NASA researchers got a peek at one of the sun's most mysterious regions, where temperatures fluctuate from tens of thousands of degrees Fahrenheit to several million, and solar flares and coronal mass ejections originate – potentially threatening spacecraft, Earth-based communications and the lives of explorers in space.

To learn more about this turbulent region of the sun, known as the transition region, Marshall Space Flight Center solar physicists and engineers designed the Solar Ultraviolet Magnetograph Investigation, or SUMI, to determine the strength and direction of magnetic fields in a region of the sun where the magnetic field had never been measured.

The transition region is a thin layer of the solar atmosphere tucked between the surface and its outermost level. Solar flares erupting here can blast their way toward Earth, shorting out ground circuits and generating radiation capable of killing a space explorer. Such outbursts seriously impact humanity's ability to expand into space, so understanding and predicting them is critically important.

In recent years, scientists have learned that the geometry of the magnetic field in the transition region directly relates to such solar

*See **SUMI** on page 3*



Marshall scientist Ed West assembles the optical system of the Solar Ultraviolet Magnetograph Investigation telescope.

Open House postponed; event planned for Marshall's 50th anniversary Sept. 8

A planned Open House for the Marshall Space Flight Center has been postponed until next year. The Open House had been intended to be part of the observation of the center's 50th anniversary.

The center will conduct a 50th anniversary event for employees and retirees Sept. 8, the date Marshall was dedicated in 1960. Also on Sept. 8, a ceremony is being planned with local community leaders to unveil a historic marker recognizing the dedication of Marshall since its inception. Additional details concerning these events will be distributed as plans are finalized.

ARTEMIS: Modeling the future of spaceflight

By Thomas Shattuck

A Marshall Space Flight Center engineering team is a co-recipient of the American Institute of Aeronautics and Astronautics best paper from the 2009 Modeling and Simulation Technologies Conference.

The paper, entitled "Modeling and Simulation of Variable Mass, Flexible

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Heavy Lift Launch Vehicle Cost Estimating Data Team receives NASA Cost Estimating Team Award

By Jessica Wallace Eagan

The Heavy Lift Launch Vehicle Cost Estimating Data Team received the NASA Cost Estimating Team Award on July 15. The group of 10 is made up of team members from the Marshall Space Flight Center, Kennedy Space Center, Fla., and the Marshall support contractor community.

The award was established to recognize outstanding team performance in the NASA cost community during the past year, reaching goals through commitment, motivation and communication.

The Vehicle Data Team was formed in October 2009 following the report released from the Review of U.S. Human Spaceflight Plans Committee – a group appointed by the White House that reviewed NASA's human spaceflight, and exploration capabilities and plans. NASA chartered the Data Team, led by Marshall, to develop cost and schedule estimates of various heavy lift launch vehicle concepts. Life-cycle cost estimates for 11 vehicle concepts – out of a total of 15 – were presented to NASA Headquarters on Dec. 3. In January, an additional nine vehicle concepts were estimated, and the original 11 concepts were updated with revised engine costs. The final documentation package was delivered April 9.

In addition to vehicle estimates, the team also integrated estimates from Kennedy Space Center for ground operations; estimates for engine testing from Stennis Space Center near Bay St. Louis, Miss.; facilities estimates for integrated testing at the Marshall Center, and estimates for manufacturing from the Michoud Assembly Facility in New Orleans.

"I nominated this team for this award because of the intensity they brought to the job, the importance of this work to defining the future direction of human spaceflight and the quality of the work," said Andy Prince, manager of Marshall's Engineering Cost Office in the Office of Strategic Analysis & Communications. "Many times the team members went above and beyond the minimum requirements to get additional information, revisit ground rules and assumptions, revise a basis of estimate or rerun an analysis to make sure the job was done right. The members of the team recognized the importance of our task, and brought the full level of their knowledge and experience to bear, gaining new skills as they strove to meet the difficult challenge of this high-profile estimating task."

Members of the team include Mahmoud Naderi, Spencer Hill, JC Atayde and Scott May, all of the Marshall's Engineering Cost Office; Christian Smart, Melek Ferrara and Teresa Brown of SAIC Inc. in Huntsville; Richard Webb of K-T Engineering in Huntsville; Glenn Butts of the Office of the Chief Financial Officer at Kennedy; and Mike Karpowich, an independent consultant in Huntsville.

The Cost Analysis Division at NASA Headquarters sponsors the award. This division provides cost estimates and analyses for potential future NASA programs, and assesses available cost estimating tools to guarantee that the agency's cost estimations are improving and increasing in accuracy. The division also establishes and maintains cost analysis policy and cost estimating methodologies, and communicates these improvements to internal and external stakeholders.

Eagan, an AI Signal Research Inc. employee and the Marshall Star editor, supports the Office of Strategic Analysis & Communications.

Obituaries

Edward Baker, 78, of Huntsville died July 25. He retired from the Marshall Center in 1987 as an engineer. He is survived by his wife, Louella Baker.

Jayne lrene Beutjer Gilliam, 78, of Athens died July 27. She retired from the Marshall Center in 1994 as a program analyst. She is survived by her husband, Dewayne Gilliam.

John Wayne Burton, 69, of Huntsville died July 30. He retired from the Marshall Center in 2010 as an aerospace engineer. He is survived by his wife, Faye Bates Burton.

SUMI *Continued from page 1*

activity. “The core thing we must understand to one day predict solar flares is what is changing with the magnetic field," said Dr. Jonathan Cirtain, SUMI principal investigator and astrophysicist at the Marshall Space Flight Center. "To determine what is changing in the magnetic field, you first have to be able to measure it. SUMI took the first measurements of the solar magnetic field in the transition region, where large eruptive events may originate.”

For an instrument that is just 22 inches across and 10 feet long, SUMI is shockingly complicated, though at its most basic level, it is just a complex telescope that images the sun. A small slit allows a beam of light from the sun to pass into the body of the instrument. The light then encounters an intricate device called a wave plate that works like polarized sunglasses to filter the light. As the wave plate rotates, it allows different polarizations of light through. The strength of that polarization is proportional to the direction and strength of the magnetic field.

“If we don’t see anything when the wave plate is supposed to be blocking out that specific polarization, we know there’s no portion of the magnetic field pointed in that direction,” Cirtain explained. SUMI’s instruments then analyze the light using a technique called the Zeeman Effect to determine the strength and direction of the magnetic field.

As with most projects, SUMI has faced serious challenges. It requires a complicated set of optics that not only rejects uninteresting wavelengths of light, but also admits the important ones with enough intensity to actually obtain measurable data. The cameras must operate in cold temperatures while surrounded by liquid nitrogen. Some components of SUMI have taken years to design – any scratch, piece of dirt or buildup of dust could have complicated SUMI’s ability to carry out its mission. But with careful planning and numerous inspections, SUMI engineers and scientists pressed forward.

Researchers launched SUMI on July 30 on a sounding rocket from the White Sands Missile Range at White Sands, N.M.

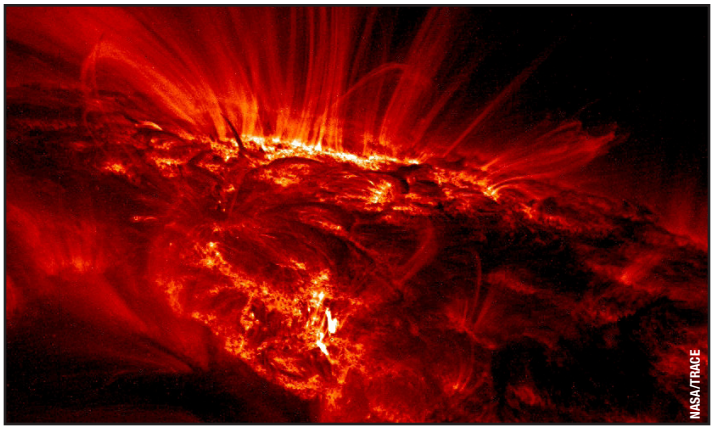
The scientists who spent years working on SUMI held their breaths and crossed their fingers as the launch countdown began. They prepared for what Cirtain has often described as “eight minutes of terror.”

“Experiment green,” said Cirtain into his headset as the rocket blasted off. “The slit is smack on the target. It’s fantastic! We are meeting our fully successful mission criteria.

“All of our systems have performed perfectly,” he added, hardly able to contain the excitement in his voice.

If everything went according to plan, SUMI provided the measurements needed to generate a snapshot of the three-dimensional structure of the solar magnetic field.

“It’s like an onion, and we’re slicing through the layers to get a picture of what the onion looks like at all these different layers," Cirtain said. "Eventually we’ll glue the onion back together and have a 3D representation of what an onion might look like – or in this case, the magnetic fields of the sun.”



The surface of the sun in ultraviolet light. Even the relatively cool, dark regions have temperatures of thousands of degrees.

Of course, that snapshot will detail just the small slice of the sun that SUMI observed, not a complete 3D model, nor one that changes over time. There’s a lot more work to be done, Cirtain said, but SUMI will demonstrate that the technology is ready to be put on a spacecraft and flown for a long-term study of the solar magnetic field in the transition region.

The next step?

“Fly the thing again!” Cirtain laughed. “It’s not a one-shot deal – get your science data and publish a groundbreaking research paper. It's the first step in a longer-term development to make those kinds of scientific breakthroughs possible.”

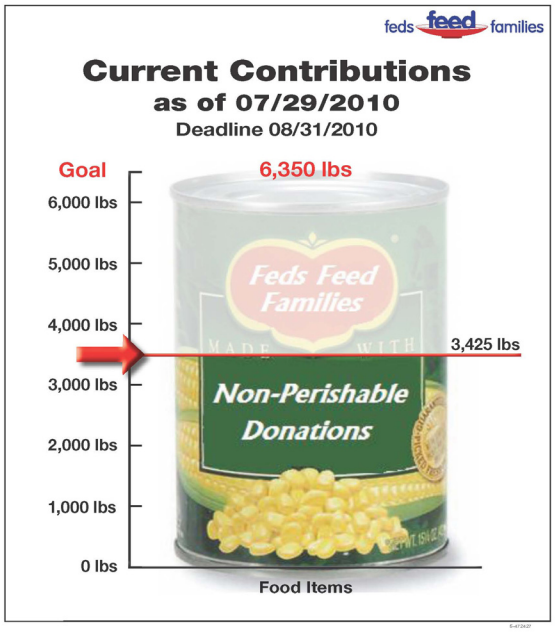
The flight will provide researchers with vital information about the performance of the telescope, which will lead to modifications to improve the experiment for another flight, hopefully in about a year. At that point, researchers will assess whether the technology is ready to free-fly on a spacecraft.

For now, Cirtain and the rest of the Marshall team are excited the launch went so well. “So you launch the thing, and that’s cool – I just fired off a rocket!" he said. "You’re taking the data, wearing the headset – it’s just like watching the folks at Houston doing what they do when they assist the space shuttle.

“But then they put you in a helicopter, and they fly you out to where your payload has just touched down," he added. "You pick it up, you put it in your helicopter and you fly back. To me, that seems like I’ve just rode in from droppin’ the herd off at Laredo – comin’ home from the range. I enjoy it, it’s a trip. Literally!”

Hopefully, it’s a trip that will put NASA scientists further along the path to understanding one of the sun’s most puzzling regions.

Brown, a communication of science and technology student from Vanderbilt University, is a summer intern working in the Public and Employee Communications Office.



3,425 pounds of food collected so far for 'Feds Feed Families'

The Marshall Space Flight Center has collected 3,425 pounds of food for the "Feds Feed Families" food drive, which will run until Aug. 29. Marshall's goal is to collect 6,350 pounds of food for needy families. The nationwide goal is 1.2 million pounds. Bins for non-perishable food items are set up in the following buildings: 4200, 4203, 4600, 4601, 4708, 4487, 4666 and the National Space Science and Technology Center. Boxes will be picked up Aug. 30. Feds Feed Families was launched in 2009 by federal agencies in Washington, responding to shortages at food banks across the nation's capital. NASA Headquarters donated 1,200 pounds of food during that initial drive, and helped expand the challenge nationwide this year. For more information or questions, contact Cindy Spidel at 544-0144.

Classified Ads

To submit a classified ad to the Marshall Star, go to Inside Marshall, to "Employee Resources," and click on "Marshall Star Ad Form." Ads are limited to 15 words, including contact numbers. No sales pitches. Deadline for the next issue, Aug. 12, is 4:30 p.m. Thursday, Aug. 5.

Miscellaneous

Pearl Snare drum and bells, $100. 256-655-7444

Trane air handler for two tons of air conditioning, 1/4 HP motor, $325 obo. 256-883-1468

Rear bumper for 1969 Chevelle, original GM part, photo available, $25. 256-653-4717

Everlast punching bag, $50. 256-759-3009

iPhone 3G,16GB, in Otterbox case, charger, cord, $75. 256-617-3334

Snapper riding mower, 26" cut, bagger, $350. 256-468-0785

Large oak dining table, four chairs, $200. 256-885-2535

Intex 18' easy set above ground pool, accessories, larger pump, floats, $350. 256-337-3500

Playstation 3 game, Little BIG Planet, Game of the Year edition, rated E, $30. 256-828-1234

24-foot aluminum extension ladder, Type 3, 200-pound capacity, $75. 256-655-6348

Two Cosco Alpha Omega 3-in-1 car seats, $40 each. 256-682-6325

Big dish equipment, Motorola DSR-922, HDD-200, 10-foot mesh dish, make offer. 256-830-0254

750-pound capacity engine stand, $50 obo. 256-651-5847

Miscellaneous home lighting fixtures, gold-colored, glass design, $125. 256-464-3135

Vehicles

2007 Camry LE, 61k miles, $12,500; 2006 Honda Shadow Aero motorcycle, extras, $5,500. 256-509-2895

2007 Honda cbr1000rr, $6,300. 205-807-7841

2006 Toyota Tundra double cab, black, tan interior, bed cover, 52k miles, $16,900. 256-509-9431

2006 Kawasaki Drifter, 800cc, 1,450 miles. 256-509-5375

2006 Ford Escape Limited SUV, red, four door, leather seats, luggage rack. 256-270-7702

2002 Chevy Tahoe LT, 5.3 liter, towing package, leather seats, front/rear air, 173k miles. 256-771-3697

1999 Kia Sephia, air conditioning not working, 95k miles, $1,100. 256-417-0474

1998 Stingray RS180 Bowrider, seats seven, bimini covers, fish/ski, new 140 I/O, $9,500. 256-640-6427

1998 Ford Windstar GL, tan, auto, 3.8 V6 engine, 118k miles, $3,600. 256-617-9614

1998 Dodge Stratus, maroon, call for specifics. 256-468-9377

1993 Prowler Camper, 24 foot, sleeps 6, 10x24 detached deck, $6,000. 256-683-3699

Wanted

Students interested in obtaining beginner to advanced scuba diver certification. 256-651-9909

Recumbent exercise bike for recovering stroke patient. 256-617-2264

Piano instructor for beginner adult. 256-783-4279 or sltiernan2010@yahoo.com

Three-point 2-12, 2-14 or 2-16 used moldboard plow. 256-891-1762

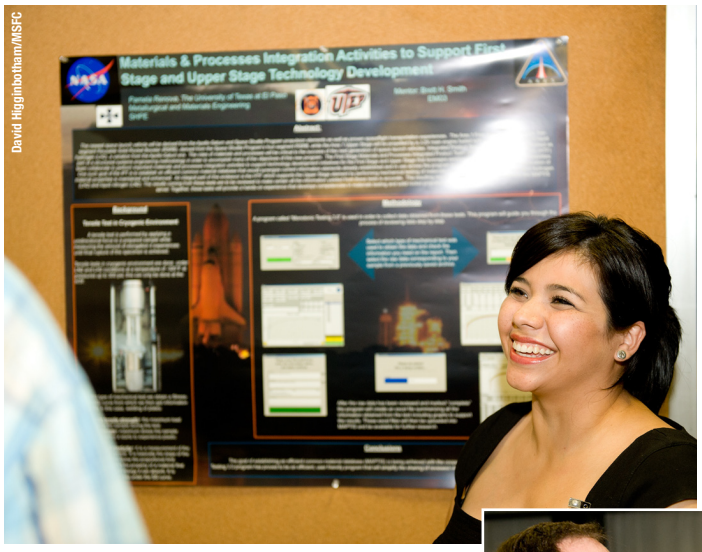
Free

System recovery CDs for Compaq Windows XP Home SP1. 256-837-6776

Found

Ladies necklace "Diana," back parking lot, Building 4732. 544-9098

Thank you, Marshall summer interns!



Summer intern Pamela Renova, at left, and some 150 of her university and high school peers participated July 29 in the Marshall Space Flight Center's annual Intern Poster Expo. Renova, who studies metallurgical and materials engineering at the University of Texas at El Paso, supported the Engineering Directorate's Materials & Processes Laboratory this summer. Other interns supported science, engineering and institutional organizations centerwide. To learn more about other summer interns, visit NASA Marshall on Facebook at www.nasa.gov/nasa.marshall.

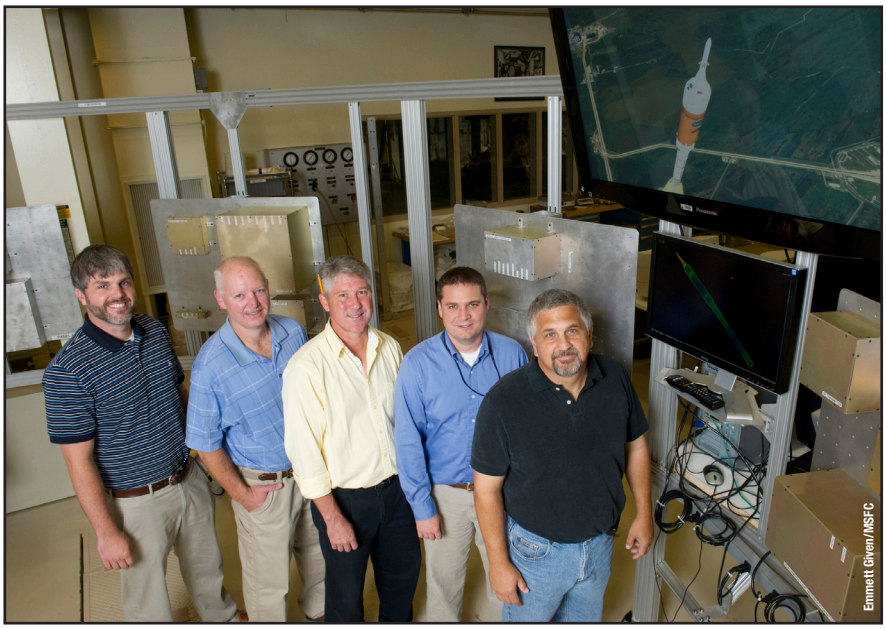
Arielle Baine, right, shows her poster to Marshall Center Director Robert Lightfoot during the expo. Baine, who studies computer science and computer engineering at Spelman College in Atlanta, helped Marshall's Office of Strategic Analysis & Communications study new ways to form partnership agreements between the center and other agencies and businesses. Hundreds of Marshall Center team members met and talked with students during the expo, which is organized and managed by the Academic Affairs Office in the Office of Human Capital.

Interns Spencer Hrdy, center, and Ellen Price, right, receive the Intern Poster Expo award for "Best Pre-College Poster" from Elana McGregor, a Lockheed Martin Space Systems engineer supporting Marshall's Materials & Processes Laboratory. Hrdy studies mechanical engineering at Oak Mountain High School, and Price studies astrophysics at Jefferson County International Baccalaureate. Both high schools are in Birmingham, Ala. Corporate sponsor Lockheed Martin of Huntsville awarded more than $6,000 in cash prizes for the best intern posters and presentations, as chosen by teams of judges from Marshall and Lockheed. For a complete list of winning student interns, visit Inside Marshall or NASA Marshall on Facebook.

ARTEMIS *Continued from page 1*

Structures," was written by Patrick Tobbe, Alex Matras and Heath Wilson of the Space Systems Department in the Engineering Directorate. The authors are part of a simulation development team directed by Bobby Powell of the Ares System Integration Laboratory (SIL). The team developed the Ares Real-Time Environment for Modeling, Integration and Simulation, or ARTEMIS, to support Hardware-in-the-Loop (HWIL) testing and verification of Ares avionics systems and flight software.

During ascent, the Ares I vehicle deforms and bends due to aerodynamic and other external forces. The structural characteristics which govern the amount of deformation change as fuel is consumed and alter the mass properties of the vehicle. "The real breakthrough is the software's ability to account for variable mass in a flexible body system with a constant set of shape functions or modes," Tobbe said. "This is being accomplished in a real time environment and we now have a variable mass formulation that efficiently re-computes the necessary inputs for these equations as the mass varies."



Members of the ARTEMIS team, from left, include Heath Wilson, Bobby Powell, Pat Tobbe, Alex Matras and Marlin Williamson.

According to SIL team lead Drew Hall of the Space Systems Department, "being able to run a flexible body model in real time allows us to provide a higher fidelity simulation. Ultimately this provides designers and engineers a higher degree of confidence that the avionics system will perform appropriately in its intended environment."

With the high fidelity dynamics model complete, the next stage in development is to incorporate the ARTEMIS program with avionics hardware. ARTEMIS was successfully integrated with first stage avionics components at Alliant Techsystems Inc. in Utah to provide a simulated vehicle environment to stimulate and test this hardware.

The real strength of ARTEMIS is its ability to be reconfigured for different vehicles. Tobbe described the process as "building new input files for flexible body data, mass properties and geometry, stages and flight phases. ARTEMIS can be easily reconfigured for heavy launch vehicles, satellites in orbit or other single or multi-stage spacecraft."

Shattuck, a chemical engineering student from Vanderbilt University, is a summer intern working in the Public and Employee Communications Office.

MARSHALL STAR

Vol. 50/No. 45

Marshall Space Flight Center, Alabama 35812
256-544-0030
http://www.nasa.gov/centers/marshall

The Marshall Star is published every Thursday by the Public and Employee Communications Office at the George C. Marshall Space Flight Center, National Aeronautics and Space Administration. Classified ads must be submitted no later than 4:30 p.m. Thursday to the Marshall Public and Employee Communications Office (CS20), Bldg. 4200, Room 102. Submissions should be written legibly and include the originator's name. Send e-mail submissions to: intercom@msfc.nasa.gov
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Manager of Public and Employee Communications: Dom Amatore
Editor: Jessica Wallace Eagan

U.S. Government Printing Office 2010-623-044-00060

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